The second alternative is the basis for the proposed ontogenetic theory of alternation, the assumption being that the two germ cells of a life-history, although one is haploid and the other diploid, have potentially the same morphogenetic properties, and under the same conditions would produce similar structures. In the case of the very dissimilar generations of bryophytes and pteridophytes, the causal differences in the conditions of development are expressed broadly as follows: the spore develops free, in direct relation to soil, water, light, etc.; the fertilized egg develops in relation to the body of the sexual generation. The egg is thus removed from all the influences acting on the spore, and is exposed to a new set of nutritive and "correlative" influences proceeding from the parent body. Since each stage in the ontogeny is probably determined by the preceding stage, the general structure of the resulting organism is as fully determined by the relatively short association of egg and gametophyte among pteridophytes, as by their much longer association among bryophytes.

It is evident that this theory regards the two generations of each species as homologous, in that they are developed from germ cells with the same morphogenetic powers. The really important comparisons to make, therefore, are between gametophyte and sporophyte of the same plant; rather than between the sporophyte of ferns and gametophyte of liverworts, for example. The author promises a full discussion of the application of this theory in future papers, but in the present one he gives a very brief outline of its application to ferns, lycopods, and horsetails, comparing the two generations in each group in a most suggestive way. If the chief value of a theory lies in the work it stimulates, this ontogenetic theory should prove of great value, for it opens a large vista of experimental work.—J. M. C.

Morphology of Ruppia.—GRAVES[21] has investigated *Ruppia maritima* in all its aspects, presenting under the title of morphology, not only the gross and minute features of its morphology, but also its anatomy, ecology, and physiology. Such a compendium of statements in reference to a single species is unusual, for in general an investigator in these days is compelled to restrict his attention to one aspect of plants. For this reason, it is impossible for the reviewer to recognize the contributions to knowledge that must be imbedded in the general account, except in a somewhat restricted division of morphology. The general outline of topics is as follows: Morphology of the vegetative organs (46 pp.), in which the structure and function of stem, leaf, and root are described in great detail and contrasted with those of other Potamogetonaceae; Ecology of the vegetative organs (13 pp.), in which the hydrophytic and halophytic adaptations are presented, and the difficult problem of adaptation and heredity discussed; Reproductive organs (18 pp.), in which flower, sporangia, gametophytes, fertilization, and endosperm are described; Embryo; Fruit and seed; Seedling. The paper closes with two summaries and a bibliography of 98 titles.

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[21] GRAVES, A. H., The morphology of *Ruppia maritima*. Trans. Conn. Acad. Sci. **14**:59–170. *pls. 1–15. figs. 33.* 1908.

Some of the ecological results are as follows. Ruppia is called a water halophyte, living in salt water that would produce plasmolysis in fresh-water plants, but unable to live in water of the open ocean. The hydrophytic responses of the shoot are the weak and spreading form, the absence of stomata, the production of slime, the numerous air spaces, the lack of mechanical tissue, and the reduction of the vascular system to one axial bundle and two lateral ones in both stem and leaf. The responses of the root are a reduction of the system to small unbranched roots borne singly at the nodes, the presence of air spaces, and the concentric axial bundle. The axial and cortical bundles are thought to be useless hereditary structures.

Some of the facts in reference to the reproductive structures are as follows. The inflorescence is a reduced spadix, and a small spathe is present, which is said to have escaped the notice of investigators almost entirely. In the development of the microsporangium a large archesporial group of cells is differentiated, which later becomes septate. In the development of the megasporangium, usually only one layer of parietal cells is formed, and in one case two functioning mother cells were observed in a sporangium. The count of chromosomes was made in the microsporangium and in the reduction divisions of both gametophytes, and was found to be eight and sixteen. The male cells are produced before pollination, which is accomplished by means of the water. The endosperm is scanty, never being more than a thin layer lining the sac. The proembryo is a filament of three or four cells, the basal one becoming much enlarged to form the suspensor. The three embryo-forming cells produce at first a spherical group of cells, and it is believed that both cotyledon and stem tip are derived from the terminal cell of the proembryo, the two other cells producing the hypocotyl, adventitious root, and primary root, the last organ never functioning.

The paper contains a large amount of information in reference to a very interesting form, and the plates, some of them photomicrographs, reproduce the structures in such a way that every botanist can make his own interpretations. —J. M. C.

Orchid flowers and formative stimuli.—As a product of his visit of three months at the Buitenzorg Garden, FITTING published in the initial number of the new *Zeitschrift für Botanik* an account of his experiments on the effect of pollination and other stimuli upon the postfloration behavior of the flowers of orchids.[22] The tropical orchids, available in great abundance at this garden, are especially suited for experimental study on this point, because the difference in duration of pollinated and unpollinated flowers is sufficient to give opportunity for experimentation with unequivocal results, whether the postfloration processes are autonomous or induced. Of these processes he distinguishes four : (1) premature fading; (2) closure of the stigma and swelling of the gynostemium; (3) swelling of the ovary; (4) greening of the perianth.

[22] FITTING, H., Die Beeinflussung der Orchideenblüten durch die Bestäubung und durch andere Umstände. Eine entwickelungsphysiologische Studie aus den Tropen. Zeits. Bot. 1:1–86. *figs.* 27. 1909.